

## A CASE OF COLOUR BLINDNESS.

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THE following case is that of a man, aged 20 years, seen by me for the first time.

1. *Examination with my lantern.*—This examination was made with the largest aperture of my lantern, measuring seven-eighths of an inch in diameter. He called red A, nothing and green; yellow, red; red B, white; neutral 1, green; and green, white and red. This test was the shortest of any I made and lasted less than a minute, as I only asked the subject of it at the most to name 15 lights.

2. *Examination with the official test of the Board of Trade.*—This test is an improved Holmgren wool test in which two new test colours have been added similar to the violet and orange in my classification test. The examinee picked out and matched all five test colours, green, rose, red, purple, and orange-yellow, easily and correctly; he did not touch a confusion colour. Had I examined him by this test alone I should have passed him and had no suspicion that he was colour blind. It must be noted that colour names must not be used in testing by the Holmgren method.

3. *Examination with my spectrometer.*—The examinee said that the spectrum consisted of two colours, red and purple, with an intermediate yellowish or no colour between. The red commenced at  $\lambda 670$ . The uncoloured region, which was quite uniform, extended from  $\lambda 586$ – $\lambda 516$ . The purple extended from  $\lambda 516$ – $\lambda 400$ . The most luminous portion of the spectrum was  $\lambda 527$ – $\lambda 583$ .

4. *Lord Rayleigh's colour-mixing apparatus*—This instrument is for making a mixture of thallium green  $\lambda 535$  and lithium red  $\lambda 670$  to match sodium yellow  $\lambda 589$ . An absolutely normal match under rather difficult conditions was made by the man. His match was the same as that of Professor Trouton, Professor Porter, and myself. I must state in justice to Lord Rayleigh that this instrument, which he has kindly lent me, was not constructed as a test for colour blindness, but for ascertaining the variations which are found in different people in making the above match. It is, in my opinion, the best piece of apparatus which has yet been designed for this purpose. I give the above observation simply as an example of his ability to make this match, as it is generally stated that a colour-blind person is not able to do so.

5. *Nagel's test*—Passed.

6. *Stilling's test.*—Could not read some of the figures. Rejected.

7. *My bead test.*—Rejected. Left many definite colours; put yellow with green and called yellow, green and put violet with blue.

8. *My pocket test.*—Rejected. Called brown, red; green, grey; and green, red-green.

9. *My classification test.*—1. (Orange.) Orange and yellow-brown. 2. (Violet.) Violet, blue, and rose wools; blue glass and blue silk; purple wool, silk, and cards. 3. (Red.) Red wool; rose silk; purple glass and orange card. 4. (Blue-green). Green and brown wools; brown, yellow, and grey silks and neutral glass.



Professor F. T. Trouton and Professor A. W. Porter, the professor and assistant professor of physics at University College, were present during the greater part of the examination—namely, that with my lantern, the official Board of Trade test, my spectrometer, Lord Rayleigh's colour-mixing apparatus, and Nagel's test. This case, which is similar to many that I have examined, shows how completely the official Board of Trade test fails in detecting a very dangerous case of colour blindness. The lights used in my lantern are bright and definite colours, and similar to those used on the railway and at sea. It also shows the absolute necessity of colour names in a test for colour blindness. Many colour-blind people are able to match very accurately; in fact, I have examined the pictures of a colour-blind Royal Academician and have been unable to detect any fault in them. Further details on this point will be found in my article on *Dichromatisches Sehen* in the current number of the *Archiv für die gesamte Physiologie*, Band CXLV., p. 298.

Can we wonder that there are accidents at sea when such a test as the above is official with the Board of Trade, and not a single medical man either on the first examination or on appeal is employed by the Board of Trade? It is now over 20 years since I, as adviser to the Board of Trade and on the International Code of Signals Committee, pointed out the defects of the Holmgren test. Though the Admiralty have made the lantern which I constructed for the Board of Trade their official test, the Board of Trade still uses the Holmgren test, though in a modified and not much improved form. The Holmgren test, in addition to rejecting many normal-sighted persons, allows half or more than half of those who are dangerously colour blind to pass. Many will wonder why the examinee failed with my classification test, in which coloured wools are also employed. This is because the method is entirely different. Colour names are used and the selection of the colours is different. A colour-blind person with shortening of the red end of the spectrum may name ten pink wools correctly, but call the eleventh blue very decidedly, because the last chiefly differs from blue by the addition of rays occupying the shortened portion of his spectrum. This is the colour we require in a test, whilst the other ten are useless.<sup>1</sup>

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<sup>1</sup> The Hunterian lectures on Colour Vision and Colour Blindness. Kegan Paul, and Co., 1911, pp. 48 and 52.

